Faculty of Cognitive Sciences and Human Development

COMPARISON OF PRODUCT VISUALIZATIONS ON CONSUMER LEARNING IN E-COMMERCE

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Masters ☐

PhD ☐

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COMPARISON OF PRODUCT VISUALIZATIONS ON COMSUMER LEARNING IN E-COMMERCE

LAU CHIEW HOON

This project is submitted
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ABSTRACT

E-commerce has become increasingly popular in this era of globalization due to its convenience to both vendors and buyers conducting their business and purchase through the internet. The first thing consumers need to do when engaging with an e-commerce website is to learn about the particular product before deciding whether to purchase or not. Product visualization can improve consumer learning hence playing a significant role in influencing the consumer's buying behaviour. This project aims to compare the effect of product visualization using static 2-D and interactive 3-D product visualization on consumer learning. In addition, this study also investigate the influences of the interactivity on consumer learning. Two webpages with static 2-D and interactive 3-D product visualization respectively were developed and evaluated through experimental research using between-subject design methodology. Sixty participants were selected randomly using convenient sampling method where the data is analysed using the Independent Samples T-Test with SPSS. From the result, it is shown that interactive 3-D product visualization in an e-commerce website positively influences the product knowledge, brand attitude, and purchase intention of consumers. We also found that interactivity in interactive 3-D product visualization enhances the consumer learning as compared to the static 2-D product visualization. These results highlighted the importance of product visualization and interactivity on consumers' buying behaviour.

Keywords: product visualizations, consumer learning, e-commerce, product knowledge, brand attitude, purchase intention

ABSTRAK

E-dagang telah menjadi semakin popular dalam era globalisasi kini kerana kemudahan kepada kedua-dua penjual dan pembeli yang menjalankan perniagaan dan pembelian melalui internet. Perkara pertama pengguna akan melakukan apabila melibatkan diri dalam laman web e-dagang adalah belajar mengenai produk tertentu sebelum membuat keputusan sama ada membeli atau tidak. Visualisasi produk boleh meningkatkan pembelajaran pengguna dengan itu memainkan peranan penting dalam mempengaruhi tingkah laku membeli pengguna. Projek ini bertujuan untuk membandingkan kesan visualisasi produk terhadap pembelajaran pengguna menggunakan statik 2-D dan interaktif 3-D produk visualisasi. Tambahan pula, projek ini juga menyiasat pengaruh interaktiviti pada pembelajaran pengguna. Dua laman web dengan statik 2-D dan interaktif 3-D produk visualisasi telah dibangunkan masing-masing dan dinilai melalui kajian eksperimen menggunakan reka bentuk metodologi antara-subjek. Enam puluh peserta telah dipilih secara rawak menggunakan kaedah persampelan mudah di mana data tersebut dianalisis menggunakan Sampel Bebas T-Test dengan SPSS. Daripada keputusan itu, ia menunjukkan bahawa interaktif 3-D produk visualisasi dalam laman web e-dagang mempengaruhi pengetahuan produk, sikap jenama, dan niat pembelian pengguna secara positif. Kami juga mendapati bahawa interaktiviti dalam interaktif 3-D produk visualisasi juga meningkatkan pembelajaran pengguna berbanding dengan statik 2-D produk visualisasi. Keputusan ini menekankan kepentingan visualisasi produk dan interaktiviti pada tingkah laku membeli pengguna.

Kata kunci: produk visualisasi, pembelajaran pengguna, e-dagang, pengetahuan produk, sikap terhadap jenama, niat pembelian pengguna

CHAPTER ONE

INTRODUCTION

Background of Study

Due to the development of the Internet and Information Technology (IT), electronic commerce (e-commerce) websites were introduced in 1980 to solve limitations of traditional business, such as small target markets (Nanehkaran, 2013). The first online shopping was invented by Michael Aldrich in 1979 (Lawson, n.d.). E-commerce is a medium where consumers can purchase products online without physical contact with the product (Hazelton, 2009). With the development of e-commerce, consumers can purchase products easily without leaving home and thus save a lot of time. There are thousands of e-commerce websites that can be found on the Internet nowadays, such as Amazon, eBay, Taobao, Lazada, Zalora, and so on.

As consumers are unable to touch the product physically when shopping using e-commerce, product visualization acts as a factor that will influence consumers' behaviour and purchase intention (Kim, Kim, & Lennon, 2009). Effective product visualization in e-commerce enables consumers to see how the product looks like exactly. However, in e-commerce, the most common product visualization that is used by online retailers to display products is the static two-dimensional (2-D) product visualization. 2-D product visualization is a presentation that uses a static picture, and a description or information of the product to present the product in the website. Interactive 3-D product visualization has also been used in commercial websites recently as a result of the expansion of computer technology (Kim & Daugherty, 2005). Interactive 3-D product visualization in websites allows consumers to interact with a product via zooming in, zooming out, rotating, moving, and viewing the product from different angles.

There are several research that have examined the influence of product visualizations on consumers' behaviour in online commercial website. A study on the effect of 3-D visualization on the power of persuasion in online shopping was conducted by Kim and Daugherty (2005), and found a positive relationship between 3-D visualization and persuasion. Li, Daugherty, and Bioccca (2001) also found that participants were more active in product attribute attention, product attribute evaluation, questioning, information seeking, and purchase intention when examining the interactive 3-D products in online website. Besides, product knowledge, brand attitude, and purchase intention of consumers are positively influenced by the 3-D visualization that stimulates virtual experience, especially for geometric and mechanical products (Daugherty, Li, & Biocca, 2003, 2008).

2-D product visualization is still being used in most commercial websites in Malaysia due to the cheaper cost and less time that is needed to build static 2-D product visualizations in comparison to interactive 3-D product visualizations (Pan, Chen, Zhang, & Xu, 2009). Some researchers have also found negative effects of 3-D visualization on consumers. For example, Pan et al. (2009) argued that 2-D visualization is better than 3-D visualization because of a few reasons, such as 3-D being more difficult to control compared with 2-D, the sense of immersion in 3-D being affected by the use of 2-D devices, and longer purchasing time. Different types of product visualization have different levels of interactivity in commercial websites, and hence may influence consumer learning differently. Thus, the purpose of this project is to compare the effect of static 2-D and interactive 3-D product visualizations in e-commerce on consumer learning.

Problem Statement

In order to fulfill shopping experience in e-commerce, consumers actively seek for commercial websites that are able to provide an experience similar to onsite shopping.

However, there are not many commercial websites in Malaysia that are able to provide such an experience to their users, as most of the websites apply static 2-D visualization to display their consumer products. Static 2-D visualization is dull, as it makes consumers feel like they are reading a book with text and pictures. Consumers need to imagine how the real product looks like by looking at the static picture. 2-D visualization also does not allow consumers to view the product from different angles, like consumers would be able to with the real product in a conventional store.

There are numerous researches on 2-D and 3-D product visualization have been conducted previously, and there are different points of view on interactive 3-D visualization in commercial websites. Some researchers found that dynamic 3-D visualization is better than static 2-D visualization, while some have found that the opposite is true. For example, researchers have found that interactive 3-D visualization will evoke positive emotions and have a persuasive outcome on consumers, eventually increasing the purchase intention and consumer learning in e-commerce (Daugherty et al., 2008; Kim et al., 2009; Kim & Daugherty, 2005). Meanwhile, Khalil, Paas, Johnson, and Payer (2005) found that interactive 3-D visualization will distract users from paying full attention to the product information in e-commerce, and it also has no advantages for users with low spatial ability. Besides, difficulty in operating the 3-D model and limitations of user perception are also reasons why 3-D is not more effective than 2-D (Chen, 2004). According to Chen (2004), a high degree of freedom in 3-D visualization can cause difficulty in controlling the object. Hence, there is no strong agreement that supports whether 2-D visualization or 3-D visualization is better.

Furthermore, most of the previous researches on visualization in e-commerce have only been conducted in western countries. There have not much research conducted in Asian countries, especially in Malaysia. Besides, most of the previous studies focused on the experience that is stimulated by different types of visualization. Not many studies focused on

the influences of interactivity. Therefore, it is interesting to study how product visualizations and interactivity influence consumer learning in e-commerce within the Malaysian context.

Objectives of the Study

The general objective of this project is to compare the effect of static 2-D product visualization and interactive 3-D product visualization on consumer learning in e-commerce.

Specific Objectives. The specific objectives of this project are:

i. To develop an interactive 3-D visualization that can overcome some of the limitations of the current 3-D visualization in e-commerce.

ii. To investigate the influence of interactivity on consumer learning in e-commerce.

Research Questions

The research questions for this project are:

1. Is interactive 3-D visualization better than static 2-D visualization?
2. Will 3-D visualization with interactivity improve consumer learning?

Definition of Terms

Table 1

Definition of Visualization and Consumer Learning

Variables	Conceptual Definition	Operational Definition
Visualization	Visualization means any technique that produces images in order to communicate abstract data (Manovich, 2010).	Static 2-D and interactive 3-D product visualization was presented to participants.
Consumer learning	Consumer learning is defined as a process of consumers seek and gather the products' information and use the information to make purchase decisions (*Consumer Learning*, 2008).	Consumer learning is measured by product knowledge, brand attitude, and purchase intention.

Significance of the Study

This project tries to determine whether static 2-D or interactive 3-D product visualization in commercial websites has a positive influence on consumer learning. The significance of the study is to extend knowledge on how visualization and interactivity in e-commerce can affect consumers' responses and behaviour, and to discover the better way to display products. This is due to the fact that commercial websites have become one of the major sources for consumers to purchase products. Thus, by using the more effective way to

display products in e-commerce, the number of visitors of the commercial website will tend to increase, and eventually increase the sales of online vendors.

Scope of the Study

The project will be conducted at Universiti Malaysia Sarawak (UNIMAS), and a sample of undergraduate students will be chosen randomly from different faculties in UNIMAS.

Limitation of the Study

Due to time constraints, only UNIMAS undergraduate students have been chosen to be the sample of the project. Hence, the findings of the project are not able to be generalized to the entire population. Besides that, only one consumer product, which is a mobile phone, has been chosen to be the model in the experiment, and hence the results of the project may not necessarily apply to different types of products.

CHAPTER TWO

LITERATURE REVIEW

Types of Product Visualization

There are two main types of product visualization that can be found in commercial websites, which is the static 2-D product visualization, and the interactive 3-D product visualization. The details of 2-D and 3-D visualization in e-commerce will be discussed below.

Two-dimensional (2-D) Product Visualization. 2-D product visualization is the most typical way used by online vendors to display products in commercial websites. Traditional 2-D visualization is the presentation that uses static flat images and text to display products, such as the advertising that is usually shown in the media. Examples of 2-D product visualization in commercial websites are shown in Figure 1. Consumers can only examine the 2-D product visualization through vision and the information that is provided in the website.

Figure 1. Examples of static 2-D product visualization. Retrieved from http://www.lazada.com.my.

Static 2-D product visualization stimulates indirect experience, as users are unable to physically touch and examine products in detail from different angles (Daugherty et al., 2008). An inability to manipulate or control products in e-commerce leads to low interactivity on the website. According to Pan et al. (2009), 2-D visualization does not provide consumers the actual shopping experience as in a real store, and hence consumers feel less delight when accessing the 2-D visualization commercial websites. As 2-D product visualization gives insufficient product information, some customers may hesitate when choosing whether they want to purchase the product, because the consumers do not know how the product looks like exactly. Sometimes, the product that is received is not as expected. However, the use of 2-D product representation is still very common in various commercial websites nowadays because of the lower cost that is required to produce 2-D product representation (Pan et al., 2009).

Three-dimensional (3-D) Product Visualization. Interactive 3-D product visualization is a product representation which is dynamic and consumers are able to interact with the product. Consumers can freely zoom in and out, rotate, move, customize the product, and examine the product from different angles in interactive 3-D product visualization (Li et al., 2001, 2008). As shown in Figure 2 and Figure 3, consumers are able to zoom in and out for the detailed information of the product, view the product in 360 degrees, and customize the product according to their preferences. Hence, interactive 3-D product visualization gives a more realistic representation compared to 2-D visualization representation. Consumers would enjoy interacting with the interactive 3-D products, as the high level of interactivity that is stimulated in interactive 3-D product visualization causes consumers to feel like they are interacting with the real product.

Figure 2. Example of interactive 3-D laptop. Retrieved from http://www.asus.com/my/Notebooks_Ultrabooks/K551LN/.

Figure 3. Example of interactive 3-D chair. Retrieved from http://www.cylindo.com/furniture-viewer-demo/.

Consumers have a virtual experience when examining the interactive 3-D product presentation, which means that consumers go through psychological and emotional changes when interacting with 3-D products in commercial websites (Daugherty et al., 2008). Daugherty et al. (2008) stated that virtual experience in interactive 3-D visualization is quite similar to direct experience in onsite shopping and thus is richer than indirect experience. Direct experience is similar to a conventional store, where consumers can freely examine the product and gather the information through interacting with the product or salesperson. Virtual experience is richer than indirect experience, as it allows consumers to "interact" with the products, rather than just looking at the products. Virtual experience in interactive 3-D visualization is closer to direct experience, as consumers have a feeling of they are examining with the real product as in the market. The personal relevance, pleasure, a sense of presence,

purchase products (Kuk & Yeung, 2002). Level of stickiness also tends to be higher on highly interactive websites compared to less interactive websites. Interactive websites allow consumers to be actively involved in controlling and interacting with the displayed product, and hence causes consumers to stick to the website for a longer period of time. Consumers feel that it is fun, interesting, and enjoy accessing the highly interactive website, and thus the intention to buy the product and revisit the website will tend to be higher.

The interactivity of the website also will influence the willingness to purchase the product in e-commerce. Jiang et al. (2010) conducted a research that aimed to investigate how the purchase intention of consumers is affected by the interactivity in e-commerce based on the degree of involvement. Stimulus-Organism-Response Model (S-O-R) was used in the study to explain how interactivity influences consumers' responses. As shown in Figure 4, the stimulus is represented by the website's interactive features, the organism is represented by the cognitive and affective involvement of consumers, and the response is represented by the purchase intention of consumers (Jiang et al., 2010). Involvement is defined as "a person's perceived relevance of an object based on inherent needs, values, and interests" (Zaichkowsky, as cited in Jiang et al., 2010, p. 38).

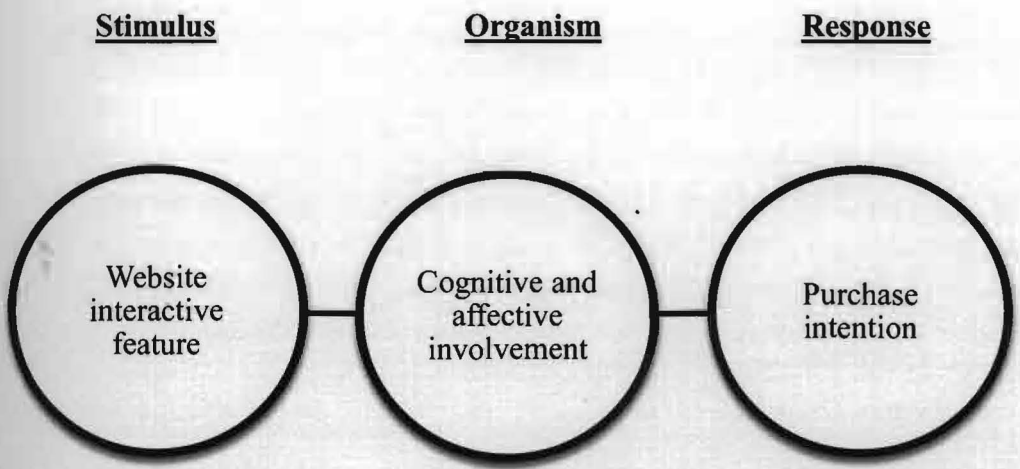

Figure 4. Stimulus-Organism-Response (S-O-R) model.

High active control in websites leads to a high level of involvement in the cognitive and affective aspects of consumers, and the purchase intention will also tend to be higher (Jiang et al., 2010). In order to obtain the relevant information of a product, customers tend to be actively involved in highly interactive websites in order to filter out any irrelevant information. Jiang et al. (2010) also found that that cognitive and affective involvement influences the purchase intention of consumers positively. When cognitive and affective involvement is higher or positive, the tendency to buy the product is higher.

As the ability to interact with products in websites improve, more and more consumers tend to perceive interactive commercial websites as a source of communication, rather than just a medium or place to buy products. Product information that is provided in highly interactive websites enhances consumers' involvement with the product (Sundar & Kim, 2005). An interactive website increases the degree of involvement and control of consumers, and therefore consumers tend to evaluate the product positively, subconsciously persuading them to purchase the product. Moreover, a study to examine the effect of interactivity in a website on information processing of consumers was conducted, and found that interactive websites can lead to more information processing than a non-interactive website (Sicilia, Ruiz, & Munuera, 2005). Interactive websites are able to increase information processing, as consumers are able to eliminate unimportant information in the website (Sicilia et al., 2005). Consumers can search for the important information directly, or for the information that they are looking for by interacting with the website. Besides, researchers also found that interactive websites are more favoured over non-interactive websites by consumers (Sicilia et al., 2005).

Consumer Learning

When a new product is announced to the market, consumers usually will have to learn about the product through directly interacting with the product, or through indirect experience (Daugherty et al., 2001). In commercial websites, consumer learning is influenced by consumption experience that products offer, and does the product meet the expectations of consumers (Hoch & Deighton, 1989). Consumer learning is defined as the learning process of consumers in order to seek and gather the product information and use the information to make purchase decisions (*Consumer Learning*, 2008). Consumer learning through a direct interactive product experience tends to be higher, as direct or physical contact with the product can minimize uncertainty and unwanted risk (Daugherty et al., 2001). Meanwhile, consumer learning tends to be lower when it is through indirect experience because of the inability to make contact with the product physically and does not know how the product look like exactly. Thus, consumer learning in e-commerce has influences on consumers' purchase decisions.

Consumers will use the gathered information in making purchase decisions. According to Mooy and Robben (1998), consumers tend to accept product information that is collected through direct experience with the product. In direct experience, the product information increases as consumers can use their multiple senses to process the information. In online shopping, consumers tend to seek for the actual experience as in a conventional store. Therefore, product visualization acts as a factor that will influence consumer learning, consumers' behaviour, and purchase intention in e-commerce, as consumers are unable touch the product physically during online shopping (Kim et al., 2009). Effective product visualization in e-commerce enables consumers to gather more product information, and assists them in decision making. Different types of product visualizations or experiences have different impact on consumer learning.

Effect of 3-D Visualization on Consumer Learning. Previous studies found that 3-D product visualization in e-commerce has a positive impact on consumer learning. Daugherty et al. (2008) conducted a study on the effect of exposure to direct, indirect, and virtual experience on consumers' brand attitude, product knowledge, and purchase intention. Undergraduate students who study at major Midwestern university in the United States were asked to evaluate a digital video camcorder which was presented in three ways, and to fill in a questionnaire that measures product knowledge, brand attitude, and purchase intention.

The findings show that virtual experience results in higher level of product knowledge, brand attitude, and purchase intention, and thus enhances consumer learning when compared to traditional 2-D advertising (Daugherty et al., 2008). This is due to the fact that a virtual experience behaves like a real product trial in the market, and allows consumers to process more information (Daugherty et al., 2008). In a real market, consumers examined the product in detail to get more information before purchasing the product. When consumers process more of the product information, more of the product knowledge will be received by customers. Once product knowledge increases, consumers' attitude toward the product tends to be positive and thus increases willingness to purchase the product.

Algharabat and Dennis (2010) also found that high level of control and animated colour 3-D product visualization able to increases authenticity of the products and hence increases tendency of consumers to purchase the displayed product. Authenticity means the ability to perceive the virtual 3-D product as a real product. A higher level of control of a 3-D product will increase consumers' involvement, fun, and enjoyment, and thus increase the tendency to purchase the product (Algharabat & Dennis, 2010). Lee (2012) also found that brand attitude that is formed through interactive 3-D visualization is more accessible and confidence-winning than brand attitude that is formed through static 2-D visualization. This is because the ability to interact with the 3-D product is able to lighten the constraints of a